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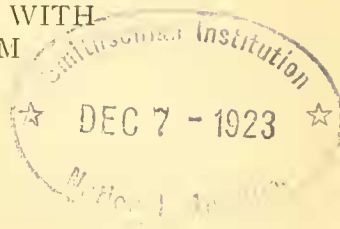
XVI

**EXPEDITION OF THE CALIFORNIA ACADEMY
OF SCIENCES TO THE GULF OF
CALIFORNIA IN 1921¹**

A REVISION OF THE GENUS ANISEMBIA, WITH
DESCRIPTION OF A NEW SPECIES FROM
THE GULF OF CALIFORNIA

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During the spring and early summer of 1921, while a member of the California Academy of Sciences' expedition to the Gulf of California, I made a small collection of Embiids, which upon study are found to represent a single species which is here described as new under the disputed genus Anisembia, whose validity it is desired to establish in this paper.

I wish to thank Dr. Barton Warren Evermann of the Academy for his kind permission to report upon this collection. Thanks are also due Dr. R. V. Chamberlin, of the Museum of Comparative Zoology, for various comparisons and for examination of material and types in the collections of that institution. Finally, I am indebted to Prof. G. F. Ferris of Stanford University for valuable assistance and criticism.

¹A map showing all the islands, etc., visited by this Expedition will be found in Vol. XII, No. 6, of these Proceedings, copies of which can be supplied at nominal cost.

July 21, 1923

The genus *Anisembia* has been the source of some confusion, largely because of the remarkable character upon which it is principally based, i. e., a single segmented left cercus in adult males. Enderlein, because of his belief in the impossibility of this character, reduced the genus to synonymy, but that he was unjustified in his conclusions seems to be certain. In the first place, he could scarcely have carefully read Melander's account of the development of *Embia texana*, which Krauss designated as the genotype. Had he done so, he must have seen the passage in which Melander (1903, p. 101) refers to the final moult of the male nymph, viz: "The nymph stage is of short duration, lasting probably not more than a week. Towards the end of that time the outer cuticle begins to separate. The *single-jointed* (the italics are mine) left cercus can be seen through the loosened chitin, extending into the second joint and reminding one of the figures of the Forficulid, *Dyscritina*." It is obviously impossible that the second segment of this cercus could be lost before the moult was completed, and Enderlein's comment that the disputed segment was broken off is certainly not justified in this species, at any rate. Furthermore, in Melander's figures of his two species, he distinctly shows setæ growing uniformly over the truncate end of the left cercus, which certainly indicates that the point of attachment, if there be such a thing, is extremely obscure. Finally, to settle the matter definitely. I have had the types of Melander's two species carefully examined by Dr. R. V. Chamberlin, who says "There isn't the slightest evidence that a second segment was ever present in the left cercus of the male in *whceleri*. The joint present is longer than the first of the right side, is enlarged at the end and curved, with setæ over its entire distal surface. We apparently have only females of *texana*, in which both cerci are two-jointed as usual. I have no doubt the asymmetry in the cerci of the males of these species is normal." As to *Anisembia sini*, new species, it can definitely be stated that the left cercus is normally of but one segment, there being not the slightest evidence of any point of articulation for another segment.

It must be remembered that Enderlein was working without material of these two species, and since it is a common thing

to find this segment broken off, it was but natural for him to reason that this must be the case as regards *texana* and *wheeleri*.

One of Enderlein's species, *Oligotoma heymonsi*, described at this time, I am also inclined to place, provisionally at least, in this genus (Enderlein, 1912, p. 114, figs. 74-76). Careful examination of the type will be necessary before this can be definitely decided. The reasons for suspecting that this species should be placed here, are as follows:

In the first place, Enderlein's figures show but a single segment to the left cercus which very nearly approximates in shape that of the other species of this genus and, although he indicates a point of attachment for a second segment, I am inclined to believe him mistaken. Examination of his figures as compared with those of all other species of *Oligotoma*, certainly shows it to be a widely aberrant form of the genus, even granting the presence of a second cercal segment. As a matter of fact, the general genitalic structure places it much closer to *A. wheeleri* and *A. texana* than to any other species of *Oligotoma* I have seen figured. Enderlein recognizes this resemblance to *texana* when he states on page 115: "Die *Olig. texana* (Mel. 1902) aus Texas unterscheidet sich durch den Genitalapparat und durch die kastanienbraune Färbung von Prothorax, Kopf und Vorderschenke." Of course, if a careful examination of his type should show genuine evidence of the presence of a second segment it will either fall out of this genus or necessitate the defining of broader generic limits.

There is one statement in Melander's paper of 1903 which might cause confusion in this connection. On page 104 he says: "The males of three species (*tartara*, *texana* and *wheeleri*) have the left cercus always single-jointed and the right one two-jointed. So far as can be judged from the descriptions, all other species (except possibly *mauritanica*) have both appendages two-jointed in the male as well as in the female." In part, his statement is misleading. While *Embia tartara* (Sauss.) was described as having a single segmented left cercus, this was undoubtedly an error, as the rest of the genitalic structure places it naturally and definitely in the genus *Embia*. Furthermore, Krauss gives a careful

redescription of the species from the type, and in his figures indicates the missing segment by a dotted outline. As careful an observer as his beautiful work shows him to be, would scarcely have done this unless there were some genuine evidence of its presence. (Krauss, Plate V, fig. 22.) As for *Embia mauritanica* (Lucas), this species is definitely described and figured as having the cercus normally segmented. (Krauss, Plate IV., fig. 20.)

Of the four species here considered as belonging to *Anisembia* but two have had winged males described. These are *A. heymonsi* and *A. texana*, where again a strong resemblance is found, these two species possessing the most reduced wing venation of any members of the order.

There is a possibility that a fifth described species of Embiid may be found to belong to this genus. This is *Embia californica* (Banks). Nothing definite can be decided, however, until adult males have been collected. There have been collected in some numbers in the vicinity of Stanford University, females of an Embiid which I am inclined to believe belongs to this species, in which case resemblances between these females and those of *Anisembia sini*, make it appear very probable that the two are congeneric. *Embia californica* was described from a male nymph collected near Los Angeles, California. The type is now in the collection of the Museum of Comparative Zoology at Cambridge, Mass.

The males of this interesting genus may be separated by means of the following key. Since the female of but one of these species has been adequately described, it is impossible to either separate the species by the characters of this sex, or, as it stands at present, to even place them safely generically.

1. Left half of supra-anal plate blunt posteriorly, with no definitely slender, caudally projecting process. Right half of supra-anal plate terminating caudad in a peculiar, flattened, bifurcate process. Length 6.5 mm.....*wheeleri* (Melander).
- Left half of supra-anal plate terminating caudally in a definitely slender process..... 2
2. Process of left supra-anal plate comparatively short, not extending as far posteriorly as terminal point of the process of the right supra-anal plate. Left process sharply truncate and with a chisel-like edge. Process of right supra-anal plate terminating in a long slender, sharply acute, process which normally extends caudo-laterally. Length 9 mm.....*sini*, n. sp.

- Process of left supra-anal plate slender; projecting further posterior than terminal point of right supra-anal plate..... 3
- 3 Process of the left supra-anal plate simple and pointed; right supra-anal plate also terminating in a simple sharply acute point. Length 6 mm.....*texana* (Melander)
- Process of left supra-anal plate terminating in a small strongly recurved hook. Right supra-anal plate terminating in a peculiar bifurcate process or hook. Length 5 mm.....*heymonsi* (Enderlein)

ANISEMBIA Krauss

1902—*Embia* Melander, p. 19.

1902—*Olynta* Melander, p. 17.

1911—*Anisembia* Krauss, p. 74.

1912—*Oligotoma* and *Haplocmbia* Enderlein, p. 109.

Orthotype, *A. texana* (Melander). Texas.

Male: Left cercus composed of a single segment which is strongly clubbed on its inner margin; supra-anal plate divided into two asymmetrical portions; wings present or absent; if present, venation much reduced; particularly striking is the obliteration of the costa and median which appear only as pigment streaks; bases of subcostal, radial, cubital and anal veins present.

Female of the usual larva form and with both cerci two segmented.

This genus is known only from Mexico and southern Texas. (Possibly it is also found in California.)

1. *Anisembia texana* (Melander)

1902—*Embia texana* Melander, pp. 19-20 and p. 26, figs. 2a-b and 3a-f.

1903—*Embia texana* Melander, pp. 98-118, figs. 1-6.

1906—*Embia texana* Mel., Friedrichs, p. 238.

1911—*Anisembia texana* (Mel.) Krauss, pp. 74-75, fig. F.

1912—*Oligotoma texana* (Mel.) Enderlein, p. 92, fig. 62 and p. 109.

Types: The holotype, a female, is in the collection of the Museum of Comparative Zoology at Cambridge, Mass. The allotype is probably in Melander's collection.

Remarks: This species is known only from Austin, Texas, where it was collected in Pease Park under stones, logs and under the bark of a fallen log, from November to March and also after the spring rains in May, at which time adult males were not uncommon.

2. *Anisembia wheeleri* (Melander)

1902—*Olyntha wheeleri* Melander, pp. 17-18, figs. 1a-b.

1911—*Anisembia wheeleri* (Melander) Krauss, p. 70, fig. G.

1912—*Haploembia wheeleri* (Melander) Enderlein, p. 70, fig. 41 and p. 109.

Types: The holotype is in the collection of the Museum of Comparative Zoology at Cambridge, Mass.

Remarks: This species was described from a single apterous, adult male, which was collected at Cuernavaca, Mexico, December 26, 1900, by Dr. Wm. M. Wheeler while excavating a nest of *Leptogynys wheeleri* (Forel.)

3. *Anisembia* (?) *heymonsi* (Enderlein)

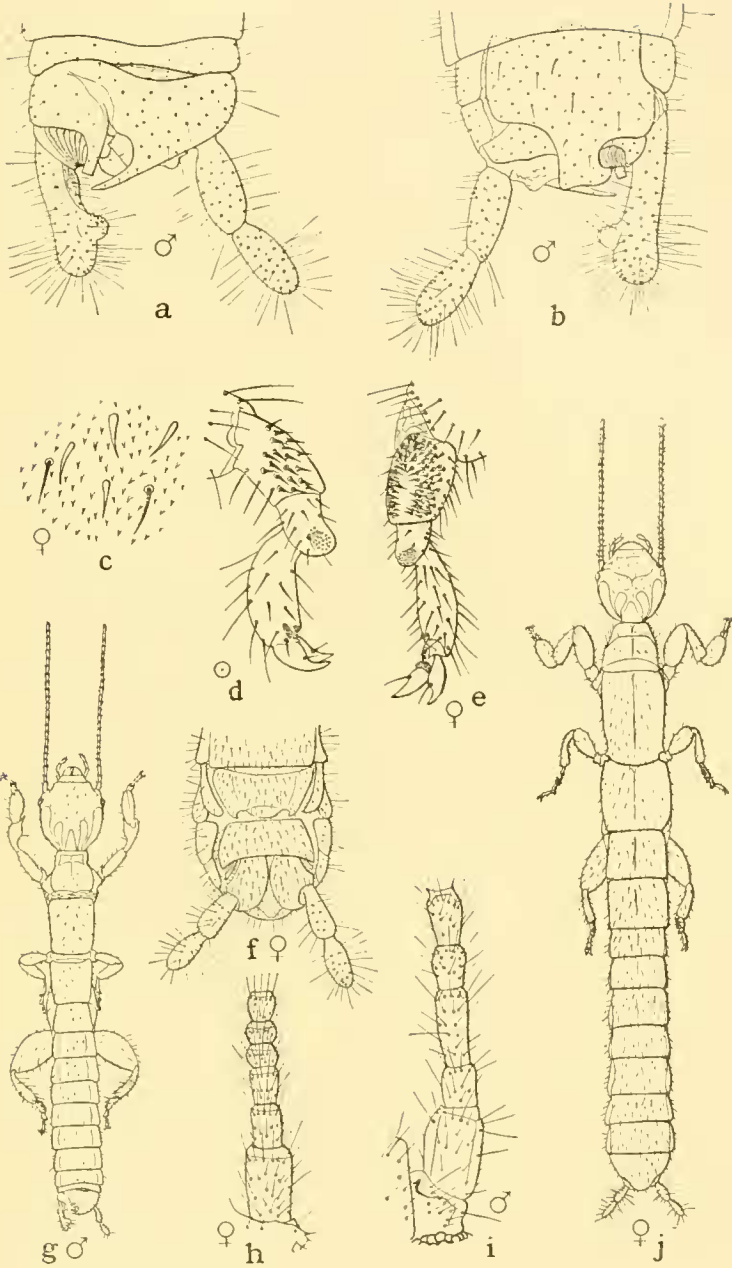
Holotype and only known specimen in the collection of the Berliner Zoologischer Museum.

Remarks: This species was described from a winged male, collected by C. A. Purpus in the Sierra Mixteca, Mexico.

4. *Anisembia sini* J. C. Chamberlin, new species

Male: *Color* (in alcohol); head reddish, labrum somewhat yellowish, basal segments of antennæ same color as head, other segments darkening distally; head with symmetrically arranged lighter areas, indicated in fig. g, by light lines; prothorax almost blackish, with a rectangular, light reddish, transverse area on anterior part of prothorax; between prothorax and mesothorax is a thin, white and much folded membrane which in contrast with the dark chitinous areas of the thorax, gives the insect a striking "collared" appearance; meso—and metathoracic shields almost black; abdomen very deep brown, somewhat reddish; supra and sub-anal plates of genitalia almost black; legs and all ventral parts (excepting head which is same color as dorsally), a very dark reddish brown.

Morphological characters: *Mouthparts* so far as can be seen present no unusual features. Segments of maxillary palpus bear the following length ratios: 8:5:6:10:13, those of the labial palpi, 6:7:12. Antennæ as long as thorax, composed of 23 segments of which the first eight bear the following length ratio: 12: 7: 11: 6: 7: 5: 8: 9: 9, all other segments about same length as 7th and 8th. *Head* longer than broad, attaining greatest width at eyes. Eyes close to posterior base of antennæ, emarginate anteriorly and reaching greatest width dorsally; submentum a prominent rectangular transverse sclerite, emarginated both anteriorly and posteriorly. *Thorax*: The lengths of the thoracic segments approximate the following ratio: 11: 13: 9; entirely apterous. Legs present nothing particularly striking; tibiæ of prothoracic legs with a forward projecting, stout spine or process, which is closely appressed to side of spinning segment of tarsus; spinning seg-



ment with a definite longitudinal furrow which appears as a dark line; mesothoracic legs weakly developed; metathoracic femora robust, strongly convex anteriorly, articulated with a prominent crescent-shaped trochantin; all legs with three segmented tarsi. The leg segments bear the following ratios to each other, (always beginning with femur):

Prothoracic legs, 3.2: 2.6; 2.7: 0.5: 1.

Mesothoracic legs, 3.2: 3.7; 2.4: 0.75: 1.

Metathoracic legs, 6: 4.5: 1.25: 0.58: 1.

Abdomen, consisting of ten visible segments, of which the ninth is very much narrowed longitudinally and tenth specialized into the external genitalic claspers; first sternite reduced to a small triangular sclerite placed between coxæ of posterior legs. *Genitalia*, (Figs. a-b); supra-anal plate divided dorsally by a deep cleft and furrow into two strongly asymmetrical parts; actual cleft extending only part way but a deep furrow continues, almost, though not quite to posterior edge of ninth tergite; left side of supra-anal plate extending caudally in a distinct process with a sharply truncated, chisel-like end; club of left cercus beset with fine tubercles; left cercus flattened inside between knob and much-folded basal membrane; right supra-anal plate terminating in a slender caudo-laterally projecting process; between ninth and tenth tergites is a small lanceolate, membranous depression; sternum of ninth segment apparently fused with that of tenth to form sub-anal plate, or possibly reduced to the small sclerite on right of sub-anal plate; on left side of sub-anal plate appear two small sclerites which apparently belong to tergites of ninth and tenth segments; projecting from beneath sub-anal plate and towards the right cercus is a roughly quadrangular chitinized plate, and immediately posterior to this is a membranous area which forms posteriorly a small projection, from beneath which extends the process of the right supra-anal plate; at base of left cercus is a small triangular chitinized plate which covers the bottom of the basal membrane and is best seen from the dorsal aspect; projecting from beneath inner curve of right supra-anal plate and between it and the hook of sub-anal plate is a small, right angled, chitinized projection or tooth. *Length* 9 mm.

EXPLANATION OF FIGURES

Fig. a. Dorsal aspect of ♂ genitalia, Fig. b. Ventral aspect of ♂ genitalia; Fig. c. Spinning spines of ♀; Fig. d. Tarsus of third leg of ♂; Fig. e. Tarsus of third leg of ♀; Fig. f. Genital operculum and terminal ventral segments of ♀; Fig. g. General dorsal aspect of ♂, x 12; Fig. h. Right antenna of ♀, same scale as Fig. i; Fig. i. Right antenna of ♂, same scale as Fig. h; and Fig. j. General dorsal aspect of ♀ x 13.7.

All figures except g and j were outlined with the aid of the camera lucida. Stippling in Figs. a, b and f indicates membranous areas; Figs. a, b, g and i are from the holotype, Figs. c and e from a paratype from Espiritu Santo Island, Fig. d from a juvenile specimen from Espiritu Santo Island, Figs. f and h from the allotype, and Fig. j from a second paratype from Espiritu Santo Island.

Female: *Color* (in alcohol) much lighter in general than male; head same as in male; thorax and abdomen dark brown, somewhat reddish; appendages lighter; membranous collar between pro and mesothorax obscure; genital operculum a little darker than remainder of abdomen.

Morphological characters: *Head*, mandibles heavy, with two or three indistinct, blunt crushing teeth; lacinia of maxillæ with two stout terminal teeth and armed along its keel with a series of 18 or 19 heavy, blunt and rather long, tooth-like setæ, and, in series with and caudad of them are 3 or 4 smaller, acutely pointed setæ; inner surface of labrum with a double row of inwardly projecting, short, heavy and blunt setæ, about 32 to the row; segments of the maxillary palpus bear the following ratio: 9: 6: 6: 8: 14, that of the labial palpus, 7: 7: 14; mentum and submentum as in male; antennæ consist of at least 22 segments (a paratype from Espiritu Santo Island with the tip of antenna broken off, has this number while a paratype from Santa Inez Island has a perfect antenna consisting of 19 segments); first nine segments of antennæ of allotype bear the following ratio: 11: 6: 6: 4: 4: 6: 6: 10: 10. *Thorax* presents no special features; segments bear following ratio: 5: 10: 7; legs typical; spinning spines of basal segment of anterior tarsus differ in no essential from those of other species (Fig. c); the remarkable comb of setæ on the third tarsus as compared with that of a juvenile specimen is illustrated in figs. d and e, they being much more numerous in adult specimens; the proportions of the leg segments may be tabulated:

Prothoracic legs 4.5: 3.8: 4: 0.25: 1.

Mesothoracic legs 3.8: 3.6: 2.2: 0.6: 1.

Metathoracic legs 9.8: 5.6: 1.4: 0.8: 1.

Abdomen, genital operculum on ventral side of eighth segment, consisting of a weakly chitinized shield as shown in fig. f; cerci symmetrical, the length ratio of their segments being as 15:13; on some specimens they appear very slightly asymmetrical. *Length* 12.5-13.0 mm.

Second (?) stage larva

Color, pale whitish, somewhat translucent.

Morphological characters: Mandibles with three teeth, more deeply incised than in adult female; keel of lacinia with but 8 or 9 heavy setæ as compared with 18 or 19 in adult female; rows of setæ on the epipharyngeal surface of the labrum but 8 or 9 as compared with the 30-33 in adult females. Antennæ of 11-14 segments; scarcely as long as head and prothorax. Fig. e illustrates the small number of setæ in the tarsal comb of third legs at this period as compared with the large number in adult females. Total length 4 mm.

Half grown (?) larva

Color, pale, much lighter than in adults.

Morphological characters, mandibles as in second stage larva; keel of lacinia with 12 or 13 setæ; epipharyngeal surface of labrum with about 16 setæ to the row. Antennæ of 20 segments. Total length 7 mm.

Remarks: Typical of all stages and both sexes is the fairly abundant vestiture of minute setæ. The lighter areas of the head are, however, practically destitute of these setæ as well as certain parts of the thorax. On the palpi, antennæ and cerci these setæ are longer and much stouter and apparently tactile in function.

Two immature stages were taken as described above. They are placed doubtfully in the classes named above, on the basis of Imms' work of 1913, and I believe them to be correct. The second stage represents the instar following the first moult after hatching.

All measurements, excepting those of total length are entirely relative and proportional and are not necessarily "cross comparable", for example the figure representing the length of a palpal segment is not proportional to the length of an antennal segment, etc. In all cases, the proportions start with the basal segments of appendages and with the anterior segment of the body proper. In the case of the legs, the basal measurement is the femur.

Type: Male, No. 1245, *allotype* female, No. 1246, Mus. Calif. Acad. Sci., collected by author, May 19, 1921, at **Loreto, Lower California.**

Material other than types. Two female paratypes from South Santa Inez Island and four from Ilsa Partida of Espiritu Santo Island. A fair series of second stage (?) larvæ from Isla Partida of Espiritu Santo Island and two specimens of the half grown (?) larvæ from San Esteban Island.

Geographical distribution. This species in all probability ranges over all the Islands in the Gulf and on both its shores. Although specimens were taken at comparatively few places, their webs were noted almost everywhere, and my field note book contains a fair number of references to them, the gist of which notes are here given for what they may be worth.

Field Notes. San Esteban Island: "Embiid webs numerous in fallen 'mesquite' leaves and under stones, but the insects themselves were scarce, only two individuals being collected." South Santa Inez Island: "Two Embiids found under stones in their ramifying tubular webs, which were very abundant everywhere, under and between stones and at the roots of

various plants, around a species of Amaranth in particular, the decaying leaves and stems of which probably furnish their food supply." Loreto, Lower California: "Embiids, male and female, found under large stone at base of small *Bursera*. Other webs were numerous, especially under cattle droppings, upon which they almost surely feed. The male was found in a web distinct from that of the female, but under the same stone." Isla Partida of Espiritu Santo Island: "Several Embiids found in their galleries which ramify in great abundance throughout the dead morning glory leaves in a small grove of *Cercus pringlei*, near the well. Comparatively few insects were collected, owing in large part, I believe, to the excessive dryness. The webs were so abundant in many places as to give to the whole mass a white, silky sheen. The small, immature forms were usually found in little colonies scattered here and there." Indian Village, Tiburon Island: "A single Embiid found in its web. Other webs seen but no more specimens taken." Unfortunately this latter specimen was later lost. Localities where the notes only record the presence of Embiid webs are as follows: "Palm Cañon," seven miles north of Pond Island on Angel de la Guardia Island; Coronados Island; del Cuesta Blanca (seven miles north of Loreto); Carmen Island; Puerto Escondido, Lower California; Monserrate Island; Agua Verda Bay, Lower California; and San Josef Island.

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